Primary Care Point-of-Care Ultrasound (POCUS)

AAPA We are Family

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Disclosures:

The presenters have nothing to disclose

Learning Objectives

At the conclusion of this session, participants should be able to...

- Identify the benefits of point-of-care ultrasound (POCUS) use in practice
- Identify applications and protocols of POCUS in primary care/family medicine
- Determine the improved health outcomes for family medicine patients with the use of POCUS for preventative medicine initiatives

Point Of Care Ultra Sound
POCUS

- Portable bedside ultrasound
- Augment patient history and physical exam
- Aide in clinical decision making
- Safely improve patient outcomes
- Focused and goal directed

The “New” Stethoscope

- Cost Effective
- Safe
- Accessible
- Efficient

POCUS Machines

POCUS in Family Medicine

- Surveys from 2015 demonstrated only 2% of FM programs had established curriculums
  - With 29% having started a curriculum within the last year
- In a survey from 2016, noted only 6% of all surveyed FM providers were using non-obstetric POCUS
- POCUS is already well-established in the Sports Med and OB, but General POCUS use is limited in the Family Medicine
- POCUS courses galore: STFM, AAFP, FMX, OAFP

Hall JW, Holman H, Bornemann P, et al. Point of care ultrasound in family medicine residency programs: a CERA study. Fam Med. 2015;47:706-711.

Barriers to Utilization in Family Medicine

- Lack of POCUS training
- Confidence in interpretation
- Limited or no access to US machine
- Cost and reimbursement concerns
- Time constraints

Hall JW, Holman H, Bornemann P, etc. Point of Care Ultrasound in Family Medicine Residency Programs: A CERA Study. Fam Med 2015;47(9):706-11.

Billing and Reimbursement

Procedural vs diagnostic vs extension of PE

Requirements:

– Medical necessity as determined by the payer
– Completeness and accuracy for the code selected
– Documented in the patient record

Complete vs limited

http://incenter.medical.philips.com/doclib/enc/13148783/Lumify_Reimbursement_Guide.pdf%3Ffunc%3Ddoc.Fetch%26nodeid%3D13148783

Coding POCUS in Primary Care

	2018 Medicare Payment for the Non- hospital Setting		Physician Fee Schedule	
	Rates apply to procedures conducted in the non-hospital setting: a physician's office, imaging center or independent diagnostic testing facility. These are national average payment rates. Actual rates are adjusted by geographic region			
CPT code*	CPT code descriptor	Global payment (i f applicable)	Professional payment (- 26)	Technical component (TC)
	General ultrasound codes			
76604	Ultrasound chest, real time with image documentation	$89.15	$27.57	$61.58
76705	Ultrasound exam, abdominal, soft tissue limited (e.g., single organ, quadrant, follow-up)	$92.74	$30.08	$62.66
76775	Ultrasound retroperitoneal, abdominal back wall – limited	$58.72	$29.36	$29.36
76857	Ultrasound exam, pelvic, limited (non-OB)	$48.33	$25.42	$22.91
93971	Extremity study – DVT (vascular)	$122.80	$22.91	$99.89
	Ultrasound Guided Procedure Codes			
76937	Ultrasound guidance vascular access	$31.87	$14.68	$17.19
76942	Ultrasound guidance for biopsy/guided injection	$61.58	$34.01	$27.57
49083	Abdominal paracentesis w/imaging	$299.32	Global Payment	Global Payment
	Musculoskeletal (MSK)			
76882	Ultrasound extremity non-vascular limited	$36.52	$25.06	$11.46
76942	Ultrasound guidance for biopsy/guided injection	$61.58	$34.01	$27.57
20604	Drain/ inject small joint/bursa with ultrasound: e.g. finger, toe	$73.40	Global Payment	Global Payment
20606	Drain/ inject mid-size joint/bursa with ultrasound: e.g. wrist, elbow	$81.28	Global Payment	Global Payment
20611	Drain/ inject large joint/bursa with ultrasound: e.g. hip, knee	$93.09	Global payment	Global Payment
	Soft Tissue			
76536	Ultrasound exam of head and neck (soft tissues – e.g. thyroid)	$117.80	$28.64	$89.15
	Pelvic			
76815	Ultrasound, pregnant uterus – limited (e.g., fetal heart beat, placental location, qualitative amniotic fluid and/or fetal position)	$85.57	$33.30	$52.27
76857	Ultrasound exam, pelvic, limited (non-OB)	$48.33	$25.42	$22.91
	Other			
G0389	Ultrasound exam AAA screen	$121.79	$29.72	$92.07

http://incenter.medical.philips.com/doclib/enc/13148783/Lumify_Reimbursement_Guide.pdf%3Ffunc%3Ddoc.Fetch%26nodeid%3D13148783

Full Spectrum POCUS: Applications

- Inpatient
- Outpatient
- Obstetrics

POCUS: Applications Outpatient / Family Medicine

- Abdominal/Hepatobiliary: ascites, AAA, gallstones
- Cardiac: heart failure, volume status
- Pulmonary: effusions, pulmonary edema, pneumonia, pneumothorax
- Genitourinary: hydronephrosis, stones, urinary retention
- MSK: effusions, tendon rupture, cellulitis, abscesses
- Vascular: deep vein thrombosis, venous access
- Soft Tissue: foreign body, cellulitis, abscess, cyst
- Obstetrics
- Procedures: steroid injections, needle guidance for access, injections, aspiration, +/- para/thoracentesis

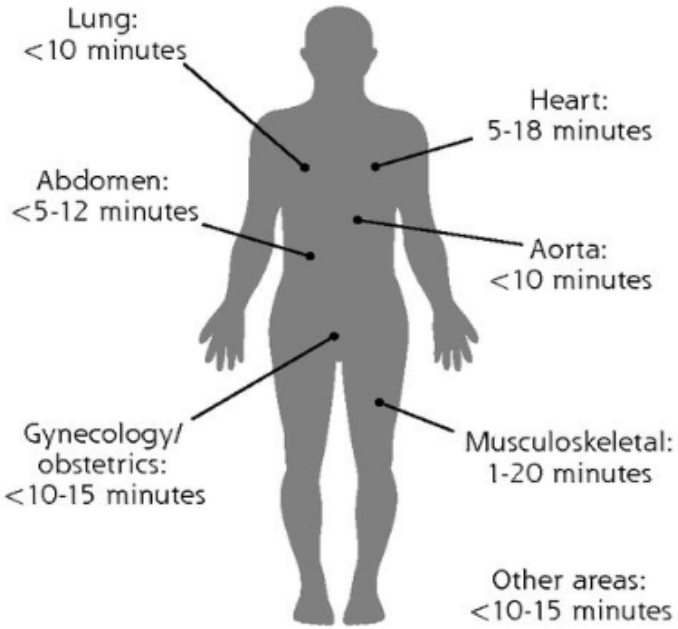
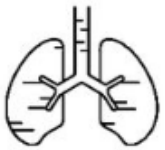
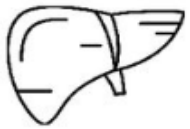
Point-of-care ultrasound: How accurate? How much training?

Protocol	Sensitivity	Specificity	Training requirement	Time required to perform protocol
Evaluation for left ventricular systolic function (compared with expert sonography)[20,21,23]	69%-94%	91%-94%	8 hours of training or 20 practice exams	*
Evaluation of IVC to determine volume status and predict readmission for CHF[26,27]	81%	72%	4 hours of training and 20 practice exams	*
Evaluation for pleural effusion (compared with CT or expert sonography)[32,33]	94%	98%	3 hours of training	*
Evaluation for pneumonia (compared with x-ray or CT)[38,39,41]	90%-96%	88%-93%	3 hours of training	*
Evaluation for pulmonary edema (compared with final diagnosis by blinded chart review)[44,48]	86%-100%	92%-98%	5 practice exams	*
Screening exam for AAA (compared with expert sonography)[55-57]	100%	100%	50 practice exams	<4 minutes
Evaluation for proximal leg DVT (compared with expert sonography)[63-65]	95%	96%	10 minutes to 5 hours of training	<4 minutes

AAA, abdominal aortic aneurysm; CHF, congestive heart failure; CT, computed tomography; DVT, deep vein thrombosis; IVC, inferior vena cava.

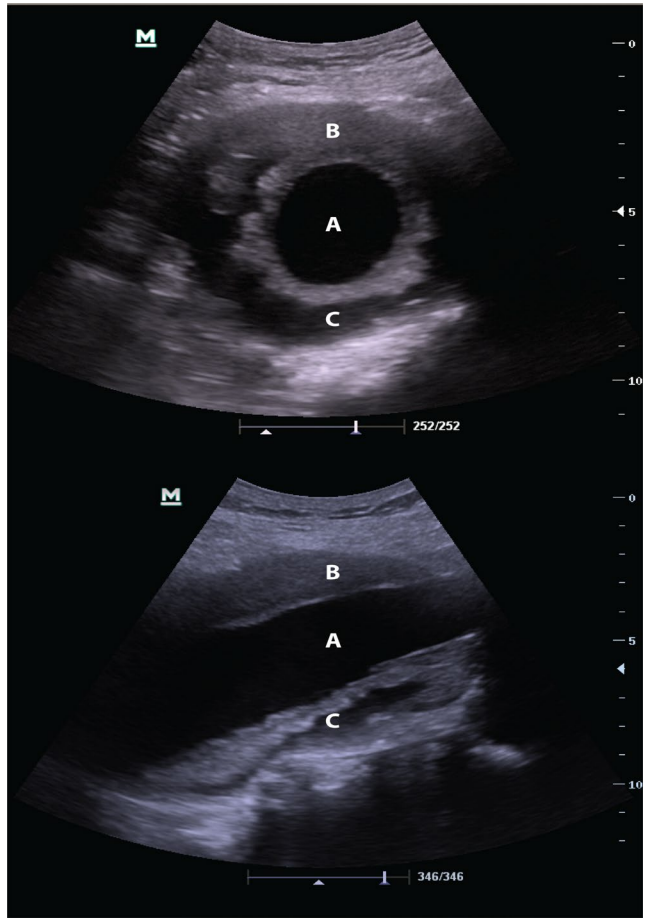
*Time required to perform was not evaluated for these protocols in the literature that was reviewed.

Bornemann P, Jayasekera N, Bergman K, Ramos M, Gerhart J. Point-of-care ultrasound: Coming soon to primary care? J Fam Pract. 2018 Feb;67(2):70-80.

Scanning Time	Examination Type, Diagnostic Purpose	References
	 **Heart** Focused examination: 8 studies; full examination: 3 studies Diagnostic purpose: 10 studies; screening: 2 studies	20-22, 27, 32, 39, 42, 52, 58, 65, 67
	 **Lung** Focused examination: 4 studies Diagnostic purpose: 4 studies	22, 30, 32, 38
	 **Aorta** Focused examination: 11 studies; full examination: 1 study Diagnostic purpose: 9 studies; screening: 4 studies	17, 19, 20, 22, 32, 37, 51, 57, 59, 62, 63, 65
	 **Abdomen** Focused examination: 16 studies; full examination: 3 studies; ND: 3 studies Diagnostic purpose: 18 studies; screening: 7 studies	18, 20, 25, 26, 28, 29, 31, 32, 34, 37, 41, 43, 47, 48, 51, 57, 58, 62, 63, 65, 66
	 **Gynecology/obstetrics** Focused examination: 11 studies; full examination: 7 studies; ND: 7 studies Diagnostic purpose: 23 studies; screening: 6 studies	20, 23, 24, 29, 34-36, 40, 43, 45-47, 49-51, 53, 55-58, 60-62, 64, 66
	 **Musculosketal** Focused examination: 3 studies; full examination: 1 study; ND: 1 study Diagnostic purpose: 5 studies	20, 24, 29, 43, 62
	 **Other areas** Focused examination: 6 studies; full examination: 1 study; ND: 2 studies Diagnostic purpose: 7 studies; screening: 3 studies; procedure related: 3 studies	22, 24, 29, 35, 43, 44, 54, 58, 62

Andersen CA, Holden S, Vela J, Rathleff MS, Jensen MB. Point-of-Care Ultrasound in General Practice: A Systematic Review. *Ann Fam Med*. 2019;17(1):61–69.

Abdominal AAA Screening



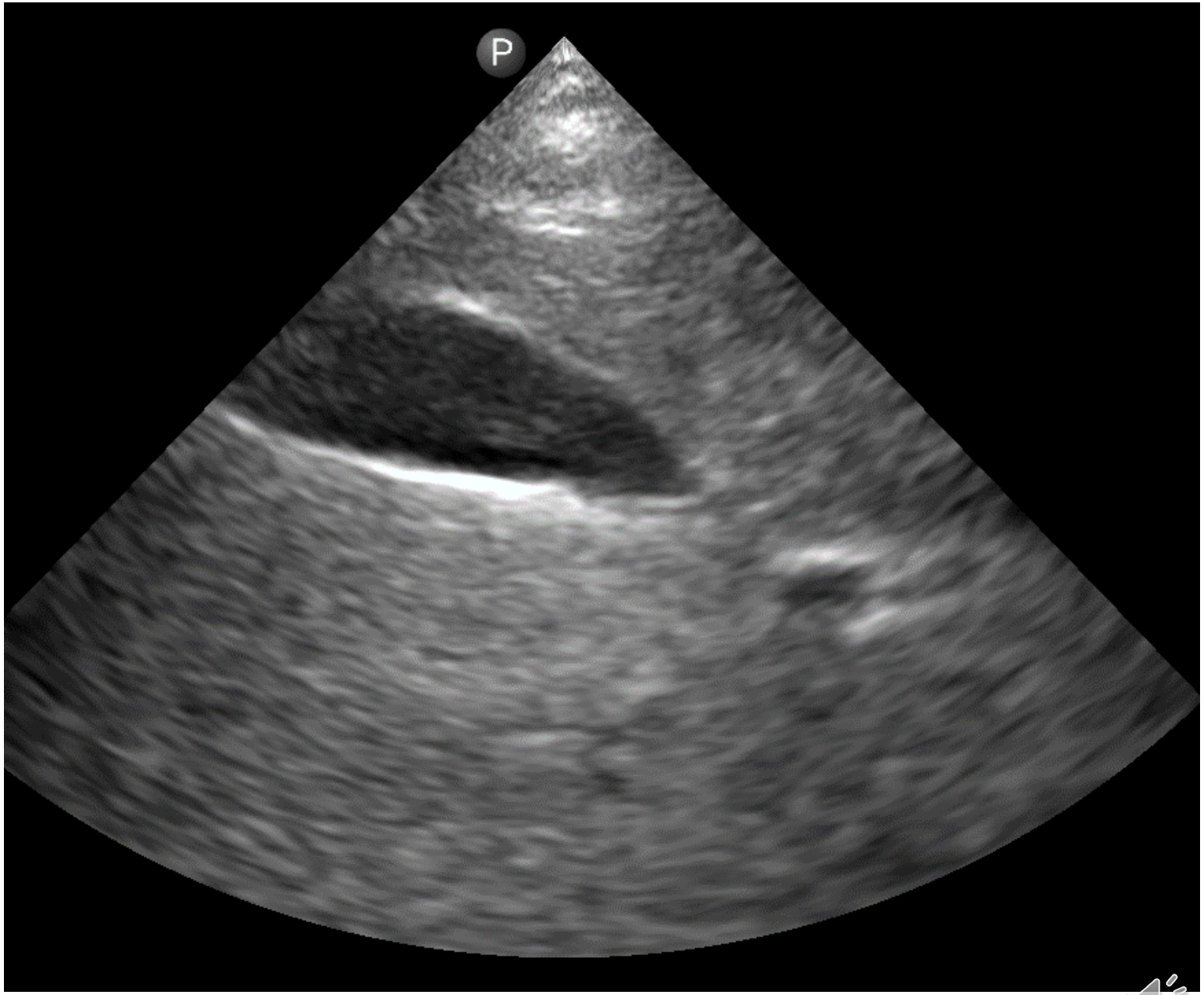
Point-of-care ultrasound images of the abdominal aorta
Top: transverse section; Bottom: longitudinal section
Both the transverse and longitudinal views of the abdominal aorta show a large abdominal aortic aneurysm with a central lumen (A), an area of stable thrombus (B), and areas of dissection or hemorrhage within the thrombus in the lateral and posterior aspects of the aorta (C).

Population	Recommendation	Grade (What's This?)
Men aged 65 to 75 years who have ever smoked	The USPSTF recommends 1-time screening for abdominal aortic aneurysm (AAA) with ultrasonography in men aged 65 to 75 years who have ever smoked.	B
Men aged 65 to 75 years who have never smoked	The USPSTF recommends that clinicians selectively offer screening for AAA with ultrasonography in men aged 65 to 75 years who have never smoked rather than routinely screening all men in this group. Evidence indicates that the net benefit of screening all men in this group is small. In determining whether this service is appropriate in individual cases, patients and clinicians should consider the balance of benefits and harms on the basis of evidence relevant to the patient's medical history, family history, other risk factors, and personal values.	C
Women who have never smoked	The USPSTF recommends against routine screening for AAA with ultrasonography in women who have never smoked and have no family history of AAA.	D
Women aged 65 to 75 years who have ever smoked	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for AAA with ultrasonography in women aged 65 to 75 years who have ever smoked or have a family history of AAA.	I

(Screening for Abdominal Aortic Aneurysm: Recommendation Statement, 2020)
Goldstein, L., & Wells, M. (2019, October 24). Point-of-care Ultrasound Trumps Computed Tomography in a Case of Abdominal Aortic Aneurysm Assessment. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6876902/

Abdominal Scanning: Gallbladder

Gallbladder studies and screenings



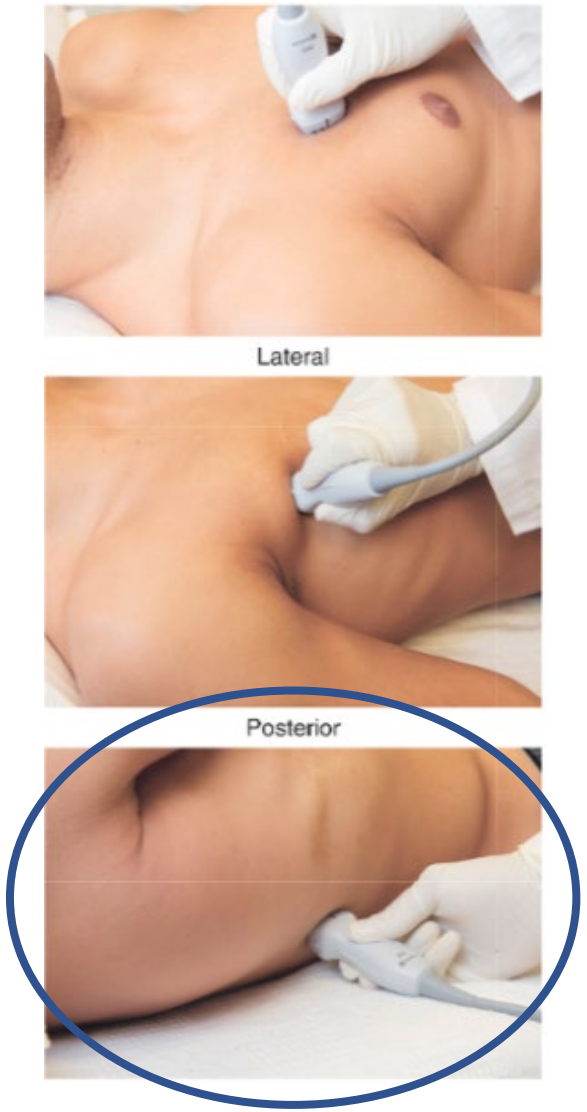
POCUS for nephrolithiasis

Smith-Bindman et al, NEJM 2014. Comparing Ultrasound vs CT for suspected kidney stones

- 2759 patients non-blinded, randomized, to POCUS, radiology US, or CT in the ED
- **No significant differences 30 days after ER visit**
  - in high-risk diagnoses with complications (AAA, appy, diverticulitis, bowel perf, pyelo, etc)
  - total or related serious adverse events
- **No significant differences in secondary outcomes**
  - ER and hospital readmission rates
  - self reported pain scores
  - accuracy of diagnosis of nephrolithiasis
- Mean radiation exposure in ultrasound groups about ½ that of CT at 6 months f/u
  - 40.7% of the patients in the POCUS group and 27.0% of the patients in the radiology ultrasonography group underwent subsequent CT

Lung/Pulmonary

- Pleural effusions
- Pulmonary Edema
- Pneumonia
- Pneumothorax



Pleural Effusion

- A 2016 meta-analysis showed that POCUS had a pooled sensitivity and specificity of **94% and 98%,** respectively, for pleural effusions, while chest x-ray had a pooled sensitivity and specificity of **51% and 91%,** respectively, when compared with computed tomography (CT) and expert sonography

Yousefifard M, Baikpour M, Ghelichkhani P, et al. Screening performance characteristic of ultrasonography and radiography in detection of pleural effusion; a meta-analysis. Emerg (Tehran, Iran). 2016;4:1-10.

Pulmonary Edema

- Looking for B lines (artifact in presence of fluid in the lungs)
- Having 3 or more B lines in a lung zone is considered abnormal
- Pulmonary edema
  - 2 or more positive zones, bilaterally
  - Positive zone = 3 or more B lines between two rib spaces
  - Based on Volpicelli zone system

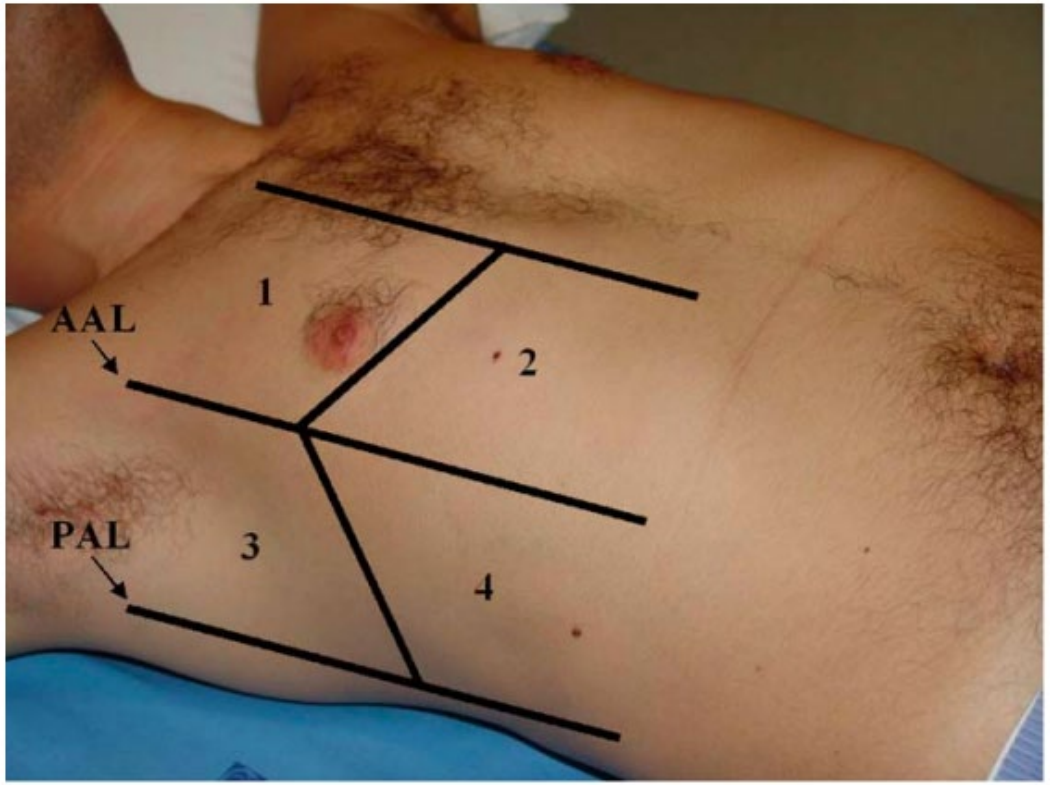


Fig. 2 The areas of thoracic ultrasonography considered in the study. Areas 1 and 2: upper anterior and lower anterior; areas 3 and 4: upper lateral and basal lateral. Each area was the same on right and left side. AAL, anterior axillary line; PAL, posterior axillary line.

Volpicelli, G. (2013), Lung Sonography. Journal of Ultrasound in Medicine, 32: 165-171. doi:10.7863/jum.2013.32.1.165

Pulmonary Edema

B-Lines for Acute Cardiogenic Pulmonary Edema	
≥ 3 B-lines in two bilateral lung zones*	
Sensitivity	94.1
Specificity	92.4
Positive LR	12.38
Negative LR	0.06

Lung US and diagnosing CHF exacerbation

- **Lung US + clinical assessment provided more clinical accuracy compared to clinical information alone, or CXR/BNP + clinical assessment**

- **Time to diagnosis was faster (5 min vs 104.5 min)**

Musculoskeletal/Skin and Soft Tissue

- Assessing for joint effusions
- Assessing for rotator cuff tears
- Median nerve assessment for Carpal Tunnel Syndrome
- Assessing for Achilles tendinopathy
- US guided injections: wrist, knees, hips, shoulders
- Cellulitis and Abscesses

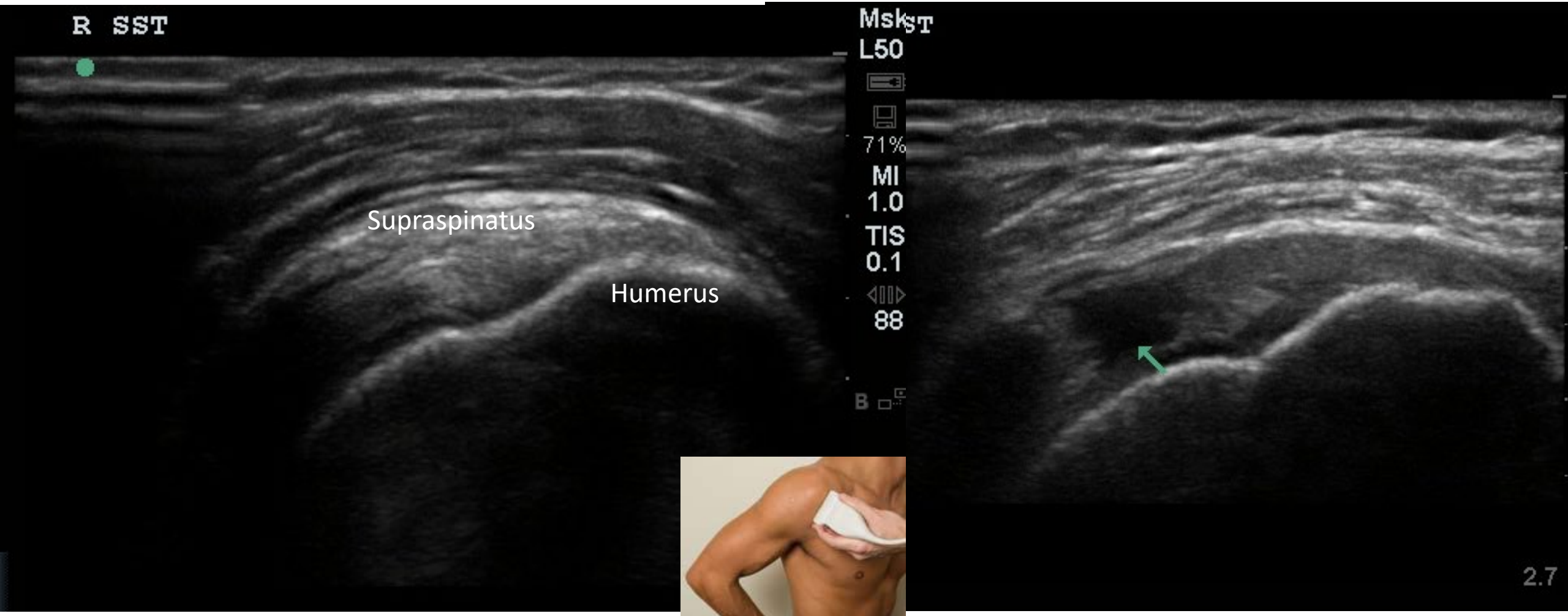
Normal Knee

Patella

Quad Tendon

Synovial Recess

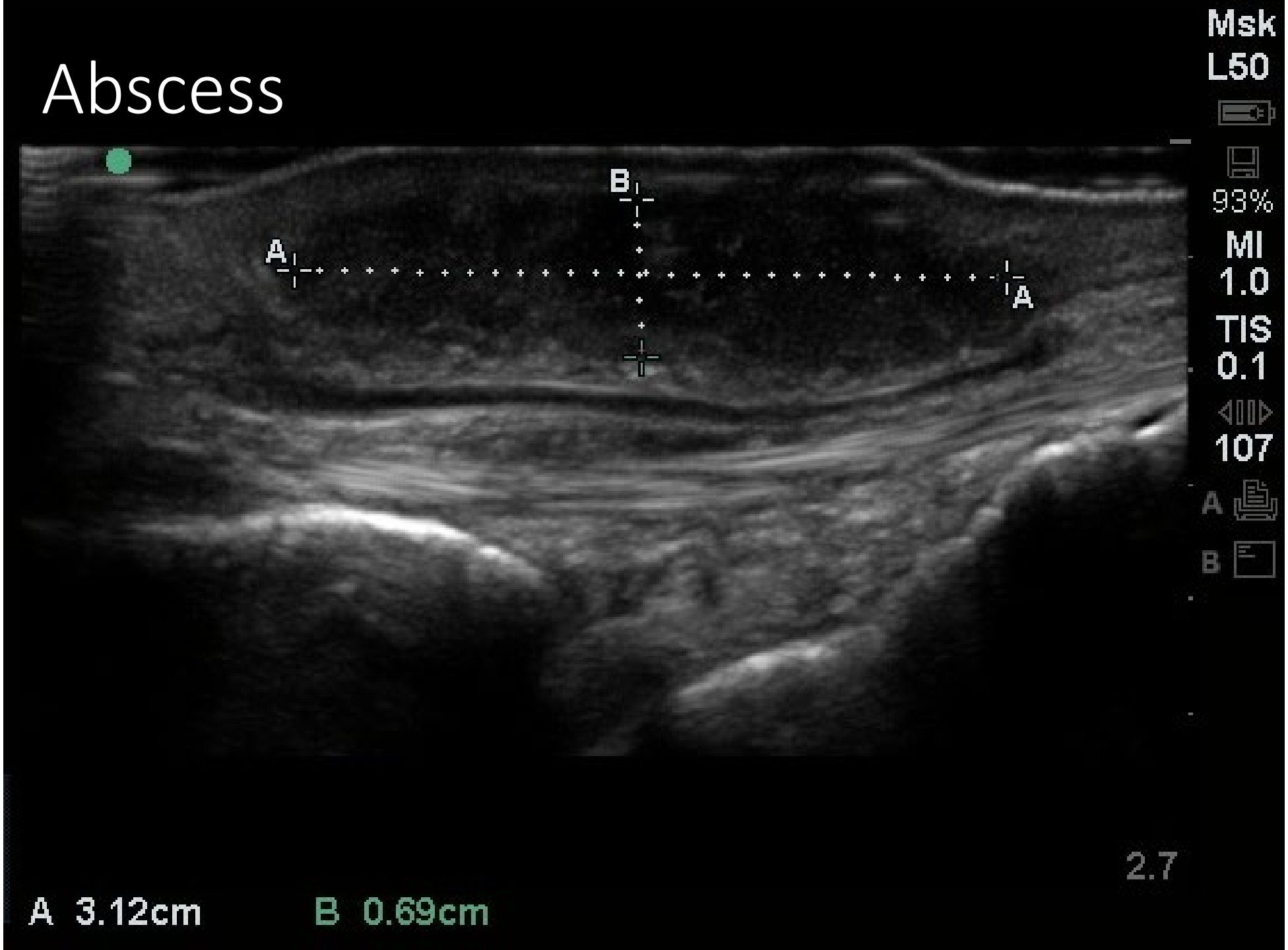
Supraspinatus Tear

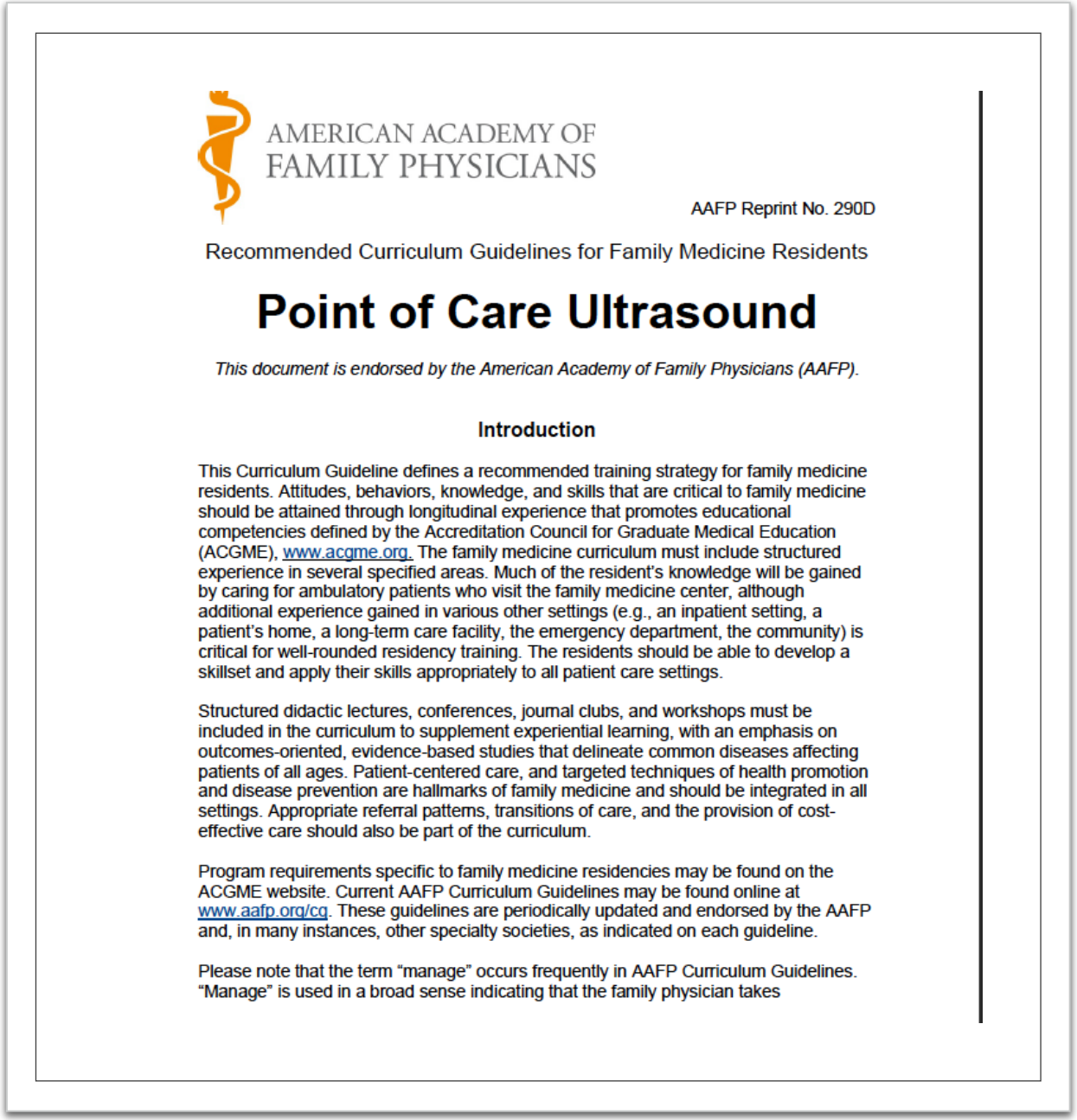


Cellulitis

Cobblestoning

Abscess





AMERICAN ACADEMY OF FAMILY PHYSICIANS

AAFP Reprint No. 290D

Recommended Curriculum Guidelines for Family Medicine Residents

Point of Care Ultrasound

This document is endorsed by the American Academy of Family Physicians (AAFP).

Introduction

This Curriculum Guideline defines a recommended training strategy for family medicine residents. Attitudes, behaviors, knowledge, and skills that are critical to family medicine should be attained through longitudinal experience that promotes educational competencies defined by the Accreditation Council for Graduate Medical Education (ACGME), www.acgme.org. The family medicine curriculum must include structured experience in several specified areas. Much of the resident's knowledge will be gained by caring for ambulatory patients who visit the family medicine center, although additional experience gained in various other settings (e.g., an inpatient setting, a patient's home, a long-term care facility, the emergency department, the community) is critical for well-rounded residency training. The residents should be able to develop a skillset and apply their skills appropriately to all patient care settings.

Structured didactic lectures, conferences, journal clubs, and workshops must be included in the curriculum to supplement experiential learning, with an emphasis on outcomes-oriented, evidence-based studies that delineate common diseases affecting patients of all ages. Patient-centered care, and targeted techniques of health promotion and disease prevention are hallmarks of family medicine and should be integrated in all settings. Appropriate referral patterns, transitions of care, and the provision of cost-effective care should also be part of the curriculum.

Program requirements specific to family medicine residencies may be found on the ACGME website. Current AAFP Curriculum Guidelines may be found online at www.aafp.org/cg. These guidelines are periodically updated and endorsed by the AAFP and, in many instances, other specialty societies, as indicated on each guideline.

Please note that the term "manage" occurs frequently in AAFP Curriculum Guidelines. "Manage" is used in a broad sense indicating that the family physician takes

Establishing POCUS Curriculum

POCUS models of learning

Educational POCUS

- Augmentation of anatomy, physiology, pathophysiology, and physical examination portions of medical education

Clinical POCUS

- Use as a diagnostic tool to assess for emergent pathologies, refine differential diagnosis, and guide treatment
- Invasive procedural guidance

Point-of-Care Ultrasound for Internal Medicine Residency Training: A Position Statement from the Alliance of Academic Internal Medicine. LoPresti C, Jensen T, Dversal R, et al. The American Journal of Medicine, Volume 132, Issue 11, 1356 - 1360

FM Areas of Concentrations that benefit from POCUS

- Rural
- Global Health
- Community Health
- Women's Health / OB

- Sports Med
- Hospitalist
- Emergency room

Barriers to Implementation

- Faculty Training
  - Need to train up FM faculty, requiring both CME time and hands-on training
  - One of the largest rate-limiting factors
- Culture
  - Perceived large learning curve
- Time
- Competency
- Credentialing
- Liability

Costs

- No current dedicated funding for POCUS training in the FM departments or PA programs.

- Equipment
  - Machines are present in all clinics
  - Acquiring more devices for expanding learners

- Billing and Reimbursement

Why Does POCUS Matter?

- Can decrease healthcare costs
- Can increase accuracy, decrease time to diagnosis
- Increase access to care (especially in rural, global, community health)
- Can improve patient satisfaction – “Laying on of Hands”
- Enhance education in anatomy and physiology
- Spark joy! (Kondo, Marie. KonMari method. Netflix. 2019)

References

- Aafp.org. 2020. *Screening For Abdominal Aortic Aneurysm: Recommendation Statement*. [online] Available at: <https://www.aafp.org/afp/2020/0515/od1.html>
- Bahner DP, Hughes D, Royall NA. I-AIM: a novel model for teaching and performing focused sonography. J Ultrasound Med 2012;31(2):295–300.
- Barron, K.R., Wagner, M.S., Hunt, P.S., Rao, V.V., Bell, F.E., Abdel-Ghani, S., Schrift, D., Norton, D., Bornemann, P.H., Haddad, R. and Hoppmann, R.A. (2019), A Primary Care Ultrasound Fellowship: Training for Clinical Practice and Future Educators. J Ultrasound Med, 38: 1061-1068.
- Boyd, Jeremy S. "POCUS for the Internist: Lungs & Pericardial Effusions." https://www.acponline.org/system/files/documents/about_acp/chapters/tn/boyd.pdf
- CF Dietrich, G Mathis, M Blaivas, et al.: Lung artefacts and their use. Med Ultrason. 18 (4):488-499 2016
- Bornemann P, Jayasekera N, Bergman K, Ramos M, Gerhart J. Point-of-care ultrasound: Coming soon to primary care? J Fam Pract. 2018 Feb;67(2):70-80.
- Evangelista A, Galuppo V, Méndez J, et al. Hand-held cardiac ultrasound screening performed by family doctors with remote expert support interpretation [published correction appears in Heart. 2016 May 1;102(9):728]. *Heart*. 2016;102(5):376–382. doi:10.1136/heartjnl-2015-308421
- Goldstein, L., & Wells, M. (2019, October 24). Point-of-care Ultrasound Trumps Computed Tomography in a Case of Abdominal Aortic Aneurysm Assessment. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6876902
- Hall JW, Holman H, Bornemann P, et al. Point of care ultrasound in family medicine residency programs: a CERA study. Fam Med. 2015;47:706-711.
- Howard ZD, Noble VE, Marill KA, et al. Bedside ultrasound maximizes patient satisfaction. J Emerg Med 2014;46(1):46–53.
- Kimura BJ, Shaw DJ, Amundson SA, Phan JN, Blanchard DG, DeMaria AN. Cardiac Limited Ultrasound Examination Techniques to Augment the Bedside Cardiac Physical Examination. *J Ultrasound Med*. 2015;34(9):1683–1690. doi:10.7863/ultra.15.14.09002

References

- Kimura BJ, N Yogo, C O'Connell, et al.: A cardiopulmonary limited ultrasound examination for "quick-look" bedside application. *Am J Cardiol.* 108 (4):586-590 2011
- Martindale JL et al. Diagnosing Acute Heart Failure in the Emergency Department: A Systematic Review and Meta-analysis. Acad Emerg Med. 2016 Mar;23(3):223-42.
- Mjolstad OC, Snare SR, Folkvord L, et al. Assessment of left ventricularfunction by GPs using pocket-sized ultrasound. Fam Pract. 2012;29:534-540.
- Silverstein JR, Laffely NH, Rifkin RD. Quantitative estimation of left ventricular ejection fraction from mitral valve E-point to septal separation and comparison to magnetic resonance imaging. *Am J Cardiol*. 2006;97(1):137–140. doi:10.1016/j.amjcard.2005.07.118
- Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. N Engl J Med 2014; 371:1100–1110
- Sorensen, B., Hunskaar, S. Point-of-care ultrasound in primary care: a systematic review of generalist performed point-of-care ultrasound in unselected populations. *Ultrasound J* **11,** 31 (2019). https://doi.org/10.1186/s13089-019-0145-4
- Wordsworth S, Scott A. Ultrasound scanning by general practitioners: is it worthwhile? J Public Health Med. 2002;24:88-94.
- Volpicelli, G. (2013), Lung Sonography. Journal of Ultrasound in Medicine, 32: 165-171. doi:10.7863/jum.2013.32.1.165
- AAFP Recommended Curriculum Guidelines for Family Medicine Residents, 2018.
- POCUS Atlas
- Soni, Nilam. "Point-of-Care Ultrasound."